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ABSTRACT

An instructor's manual and student activity guide on reading the architect's scale and the metric scale are provided in this set of prevocational education materials which focuses on the vocational area of trade and industry (drafting). (This set of materials is one of ninety-two prevocational education sets arranged around a cluster of seven vocational offerings: agriculture, home economics, distributive education, health occupations, world of work, trade and industry, and office occupations.) The instructor's guide is organized into the following elements: title of activity, duration of activity (five to eight days), activity goals, instructional objectives (six), related vocational clusters, and activity implementation (description, materials needed, safety considerations, teacher preparation prior to class, during the class, follow-up activities, answer key to student check point activities, and masters for duplication [e.g., student check sheet and a floor plan and road map to be measured by the students]). The student activity guide provides step-by-step instructions (narrative and illustrations) for completing each instructional objective (e.g., use the 1/2 scale on an architect's rule to measure and record in feet and inches). At the end of each set of instructions is a student check point (evaluation activity). Occupational descriptions for an architectural drafter and a mechanical equipment engineering assistant conclude the document. (JH)

ED169305

T & I – DRAFTING, READING THE ARCHITECT'S SCALE

Kit No. 16

INSTRUCTOR'S MANUAL

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1978

CE 020 490

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TITLE OF ACTIVITY

Kit No. 16, T & I – Drafting, Reading the Architect's Scale and Metric Scale

DURATION

Main Activity: 4 – 5 days
Follow-up Activity: 1 – 3 days

GOALS

The student will learn to read an architect's scale.

The student will learn to read the metric scale.

The student will understand some phases of drafting.

The student will learn to follow directions.

INSTRUCTIONAL OBJECTIVES

Architect's Scale

Students will be able to read architect's scale using the scale (1) measuring in feet and inches.

Students will be able to read an architect's scale using the scale (1/2) measuring and recording in feet and inches.

Students will be able to read an architect's scale using the scale (1/4) measuring and recording in feet and inches.

Students will be able to read an architect's scale using the scale (1/8) measuring and recording in feet and inches.

Students will be able to read an architect's scale using scale (1-1/2) measuring and recording in feet and inches.

Metric Scale

Students will be able to read a metric scale by measuring and recording in centimeters.

VOCATIONAL CLUSTERS

Agriculture – Home Economics – Office Occupations – World of Work – T & I – Health Occupations

ACTIVITY IMPLEMENTATION

A. Description

The student will learn about an architect's scale and the metric scale. They will learn to read scales for reducing and enlarging drawings. These additional scales are divided into inches or fractions of an inch which represent feet. These scales are used in plans for building construction and for all objects dimensioned in feet and inches.

B. Safety

Do not abuse equipment.
Keep away from eyes.

C. Materials

1. Audio Visual Equipment:

   None

2. Technical Equipment:

   Twenty-five Architect's Scales
   Twenty-five Metric Scales

3. Expendable Materials

   Spirit Master for Answer Sheet
   Spirit Master for Follow-up Activity

D. Preparation Prior to Class

The Instructor will need to run off answer sheets for students before they can answer the questions in the Student Manual.

The Instructor will need to run off Answer Sheets for follow-up activity.

E. During Class Sessions

Hand out the student checklist. Walk around in class and observe the students.

Instructor will check to see if student is keeping his eye directly above scale.

F. Follow-up Activities

1. Student is to check the VIEW Fact Sheet.

2. Student is to measure and record from answer sheet given out by teacher. (Follow-up Activities are in masters for duplication.)

ANSWER KEY

Floor Plan

1. 47' 0" x 18' 6"
2. 18' 6" x 12' 0"
3. 14' 2" x 12' 4"
4. 11' 0" x 9' 0"
5. 10' 10" x 9' 0"
6. 9' 4" x 7' 10"
7. 5' 2" x 5' 0"

Map

A

1. B
2. 31 mi.
3. 226 mi.
4. 108 mi.
5. 215 mi.

B

1. 150 km
2. 45 km
3. 340.5 km
4. 154.5 km
5. 327 km

MASTERS FOR DUPLICATION

1. VIEW Fact Sheet
2. Student Check Sheet
3. Follow-up Activities:
   - Floor Plan
   - Road Map

VIEW FACT SHEET

NAME _____ CLASS _____ OCCUPATION _____

A. List the advantages (good points) of this occupation (job).

B. List the disadvantages (bad points) of this occupation (job).

C. List three things you should know to do this occupation (job).
1.
2.
3.

D. What type of education should you get to be prepared (do) for this occupation (job)?

E. What courses must you take to go into this occupation (job)?

F. What do you think your future in this occupation (job) will be?

G. What wage can you expect in this occupation (job)?

H. What are the working hours of this occupation (job)?

I. To learn more about this occupation (job), write to:

J. Using a scale of 1 to 5, circle the number that measures your interest in this occupation (job) as a possible career.

I don't like it. ← 1 2 3 4 5 → I like it.

STUDENT CHECK SHEET

Instructional Objective I

A _____

B _____

C _____

D _____

Instructional Objective V

No. 1		No. 2	
A	_____	A	_____
B	_____	B	_____
C	_____	C	_____
D	_____	D	_____
E	_____	E	_____
		F	_____

Instructional Objective VI

	Feet	Inches
A	_____	_____
B	_____	_____
C	_____	_____

Instructional Objective VII

	Feet	Inches
A	_____	_____
B	_____	_____
C	_____	_____

Instructional Objective VIII

	Feet	Inches
A	_____	_____
B	_____	_____
C	_____	_____

Instructional Objective IX

	Feet	Inches
A	_____	_____
B	_____	_____
C	_____	_____

Instructional Objective X

	Feet	Inches
A	_____	_____
B	_____	_____
C	_____	_____

Instructional Objective XIII

A	____ . ____	cm	I	_____ . _____	cm
B	____ . ____	cm	J	_____ . _____	cm
C	____ . ____	cm	K	_____ . _____	cm
D	____ . ____	cm	L	_____ . _____	cm
E	____ . ____	cm	M	_____ . _____	cm
F	____ . ____	cm	N	_____ . _____	cm
G	____ . ____	cm	O	_____ . _____	cm
H	____ . ____	cm			

FOLLOW–UP ACTIVITY

FLOOR PLAN

Using 1/8 scale and 1/8 in. = 1 ft. 0 in. measure in feet and inches.

1. What is the size of the house?
2. What is the size of the garage?
3. What is the size of the livingroom?
4. What is the size of bedroom 1?
5. What is the size of bedroom 2?
6. What is the size of bedroom 3?
7. What is the size of the bathroom?

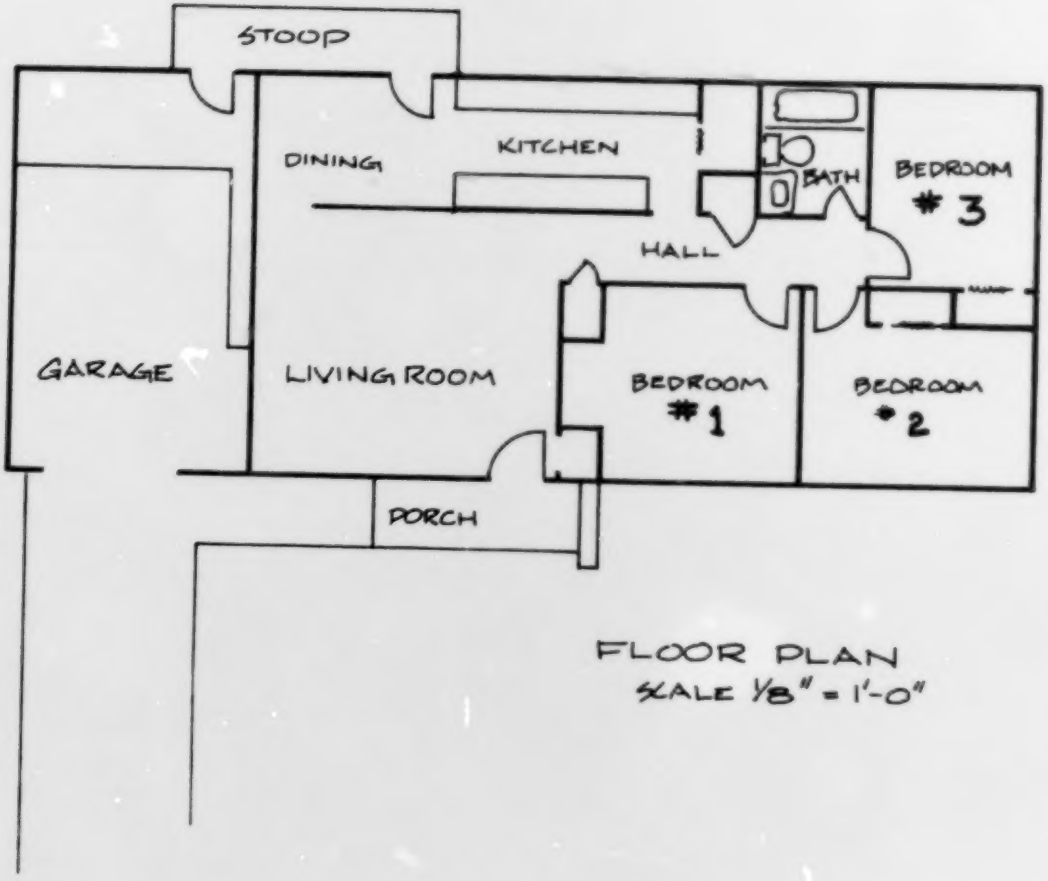
SOUTH CAROLINA ROAD MAP

A – Using scale 1 and 1 in. = 25 miles, measure the distances.

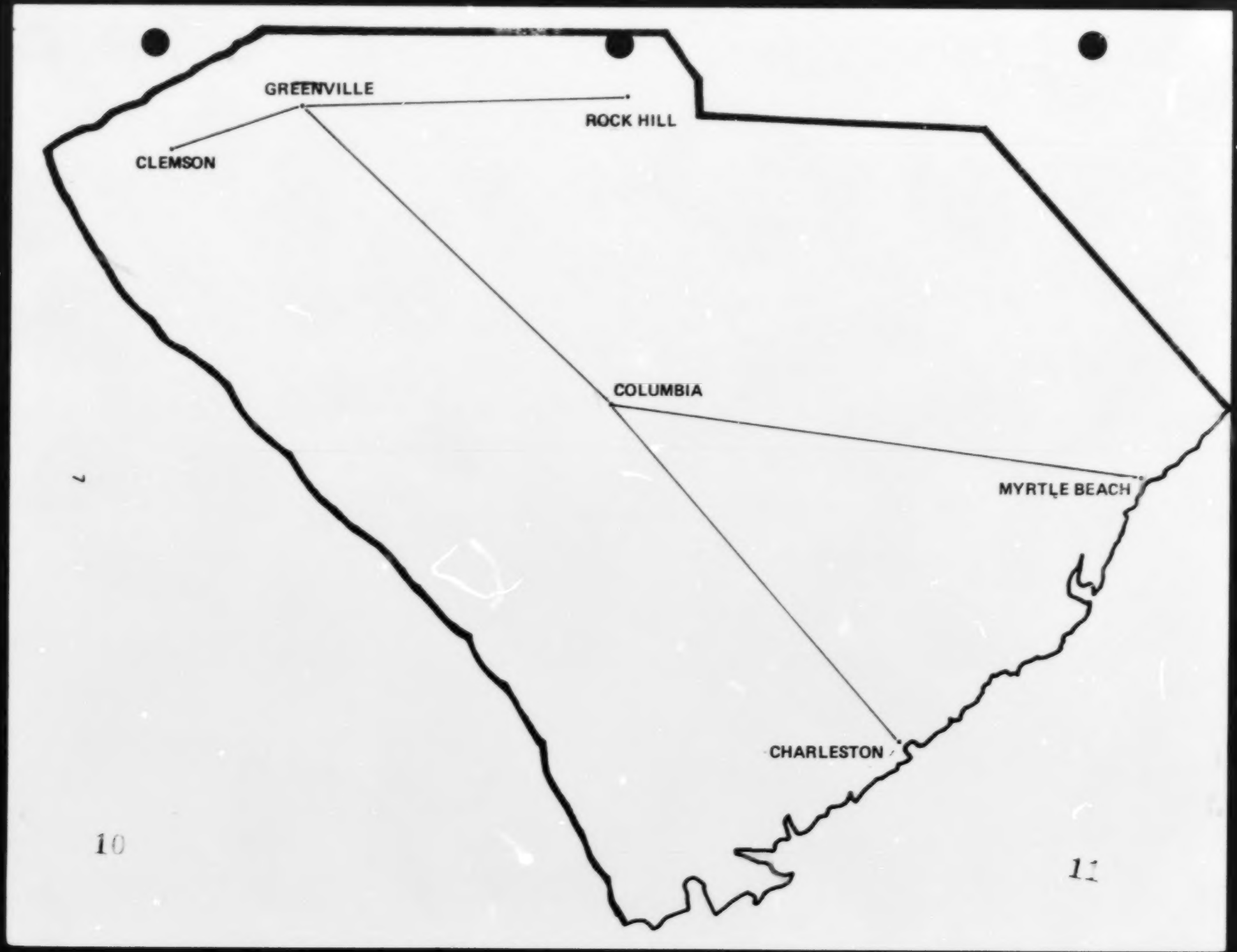
1. What is the distance from Charleston to Columbia?
2. What is the distance from Clemson to Greenville?
3. What is the distance from Charleston to Clemson?
4. What is the distance from Rock Hill to Clemson?
5. What is the distance from Myrtle Beach to Greenville?

B – Using millimeter scale and 1 cm = 15 km measure the distances.

1. What is the distance from Charleston to Columbia?
2. What is the distance from Clemson to Greenville?
3. What is the distance from Charleston to Clemson?
4. What is the distance from Rock Hill to Clemson?
5. What is the distance from Myrtle Beach to Greenville?



FLOOR PLAN
SCALE 1/8" = 1'-0"


GREENVILLE
ROCK HILL
CLEMSON
COLUMBIA
MYRTLE BEACH
CHARLESTON

T & I – DRAFTING, READING THE ARCHITECT'S SCALE

Kit No. 16

STUDENT

LEARNING ACTIVITY GUIDE

Prepared by

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DRAFTING—READING THE ARCHITECT'S SCALE

INTRODUCTION

The field of drafting is a wide open career opportunity for any young person. There are merchandise, architectural, civil, piping, electrical, and new and emerging types of draftspersons. If you look at your desk you will find that someone had to draw a set of plans before it could be manufactured. The building you are in was designed and drawn by someone. A car, engine, hammer, dress, shoes, almost anything you can imagine has been drawn before it was constructed or manufactured.

The most important tool to a draftsperson is the scale (rule). In this activity you will use two different types of scales. The first is an architect's scale. This instrument is used for reducing and enlarging objects. The programmed text will teach you how to read this instrument.

The second scale you will use is the metric scale. This scale will soon become our standard unit of measure. Most machinists and engineers have used metric measurement for many years. It is a very simple unit of measure. If you think of a dollar bill as a meter then pennies can be thought of as centimeters. If you can count to 100 or by 10's you can use the metric system. This booklet will give you step by step instructions in using this scale.

DIRECTIONS

With your material in hand open your booklet to Objective I and proceed. Be sure your answers are correct before proceeding to your next objective. If not please repeat that objective until you have it correct.

GOALS

The student will learn to read an architect's scale.

The student will learn to read the metric scale.

The student will understand some phases of drafting.

The student will learn to follow directions.

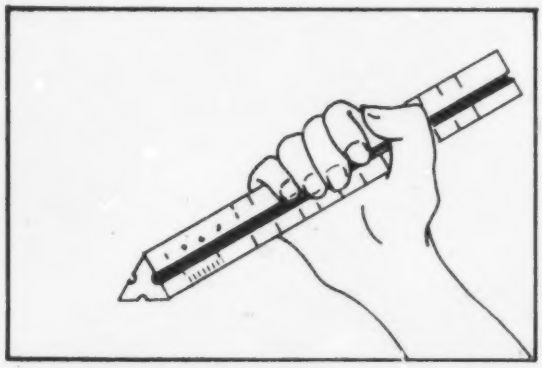
MATERIAL

Obtain a check sheet from your instructor and two scales—A metric scale and an architect's scale.

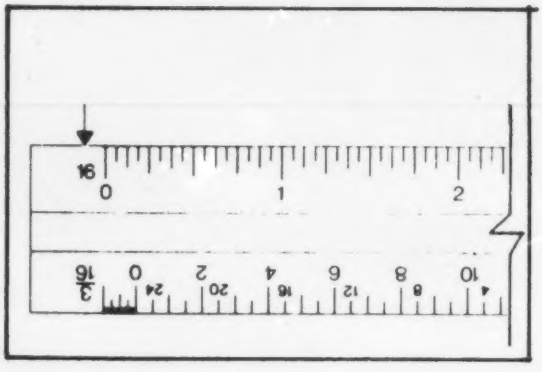
PROGRAMMED TEXT

Instructional Objective I

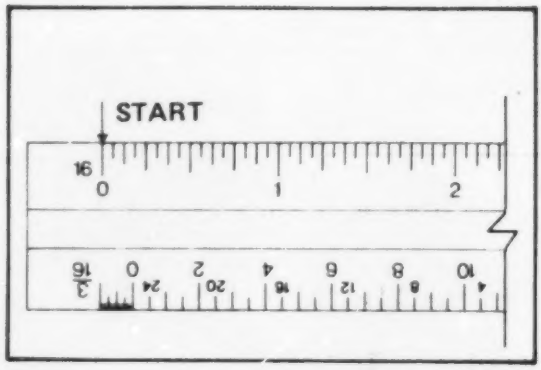
The student will read the 16 scale on the Architect's scale.



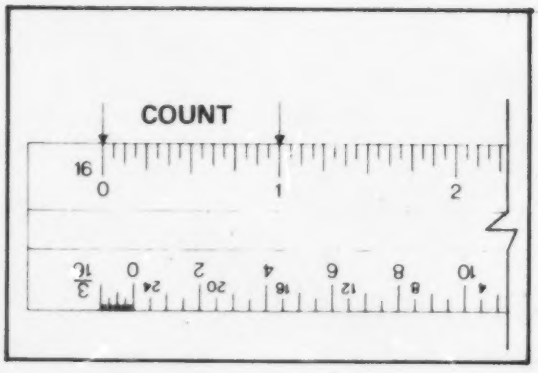
STEP 1 — The architect's scale is a three-sided measuring instrument.



STEP 2 — Rotate your scale until you see a large number 16 on the left side of your scale.



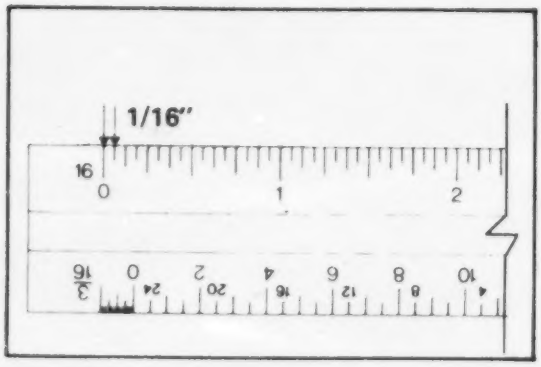
Step 3 – Start at zero.



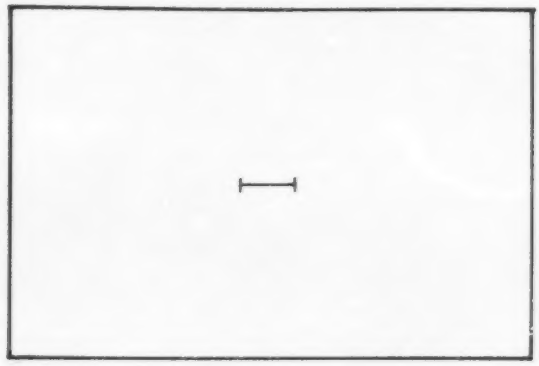
Step 4 – Moving left to right count the number of lines from zero to the number one.

Check Point

Your answer should be 16, if it is not, retrace steps 1 – 4.



STEP 5 – All these small lines are equally spread 1/16 in. apart.



STEP 6 – Now by placing the zero on the end of a line we can measure in 1/16's of an inch as in this example 5/16 in.

Check Point

Measure and record answers on your check sheet.

A ——

B ———

C ———

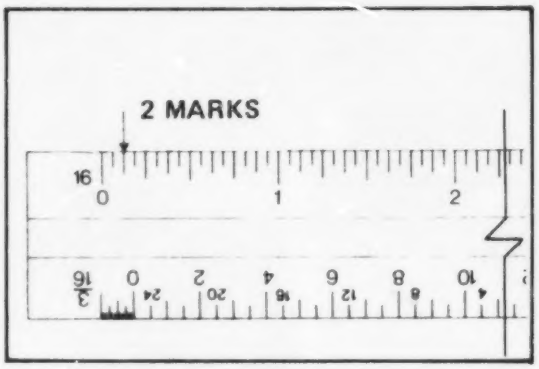
D —

Your answers should be:

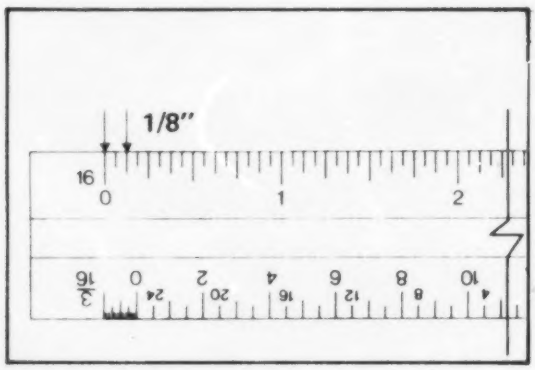
A 8/16
B 12/16
C 16/16
D 4/16

Instructional Objective II

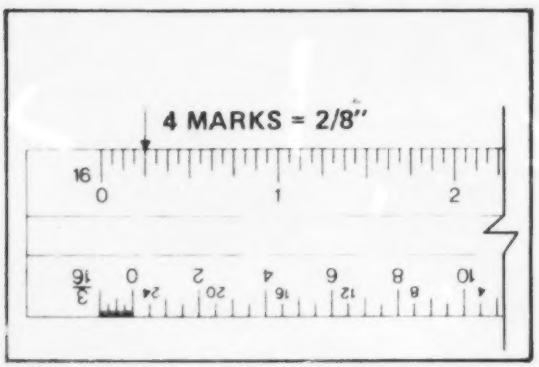
The student will measure in 1/8 in. intervals.



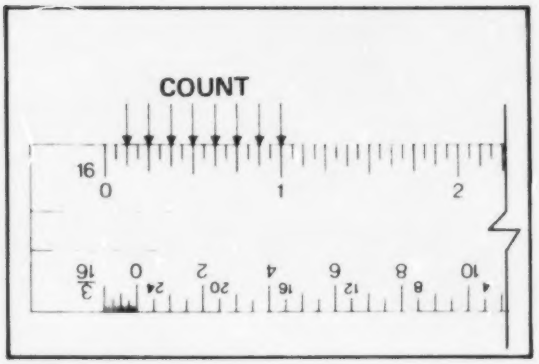
STEP 1 – Examine your scale again, this time count from zero two marks to the right.



STEP 2 – These two marks equal one eighth of an inch.



STEP 3 – Count four marks over. This is two eighths of an inch.



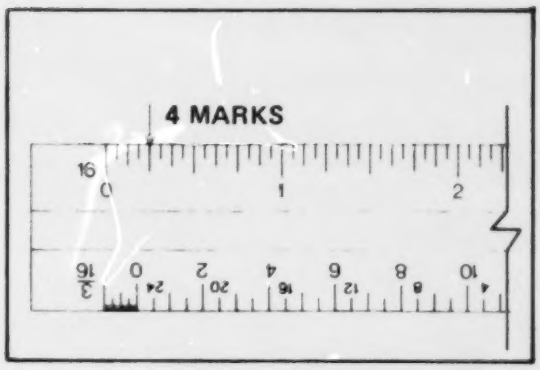
STEP 4 – Keep counting every two marks and count it as 1/8 of an inch. Stop at the large number one.

Check Point

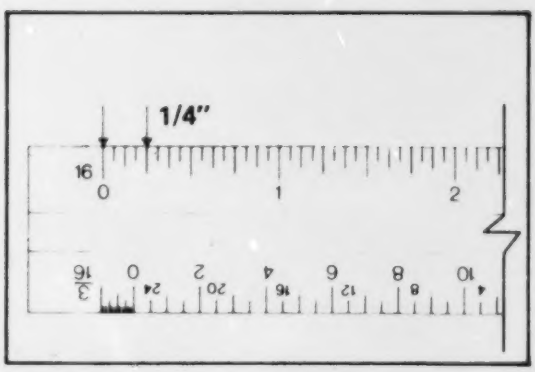
What is the number of eighths from zero to one? If you counted 8, proceed to the next step, if not, retrace steps 1 – 4.

Instructional Objective

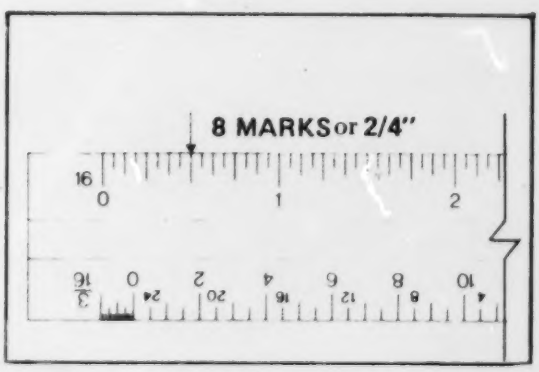
The student will measure in 1/4 in. intervals.



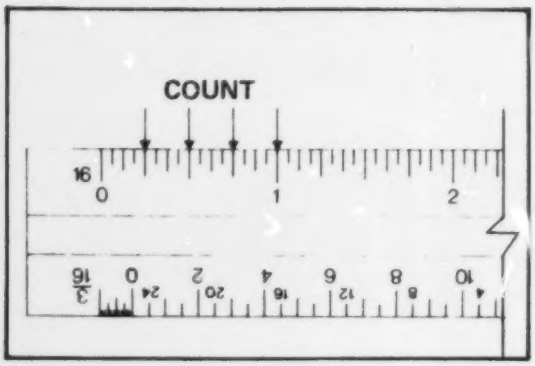
STEP 1 – Examine your scale again. This time count from zero four marks over.



STEP 2 – These four marks equal one quarter of an inch.



STEP 3 – Count eight marks over. This is 2/4 of an inch.



STEP 4 – Keep counting every four marks and count it as 1/4 of an inch. Stop at the large number one.

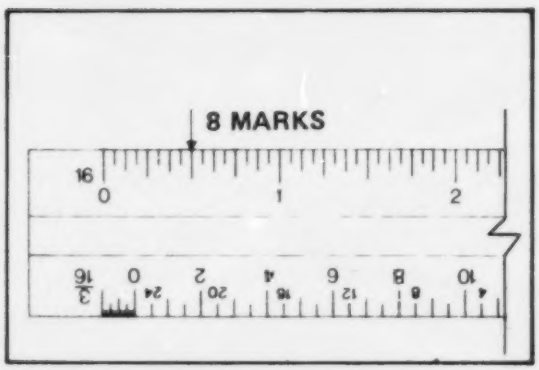
Check Point

What is the number of quarter inches from zero to one? If you counted four, proceed to the next step, if not, retrace steps 1 – 4.

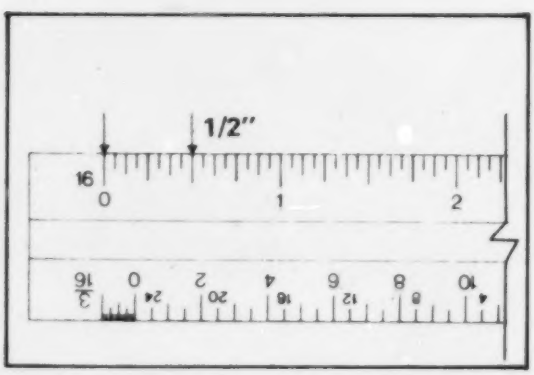
16

Instructional Objective IV

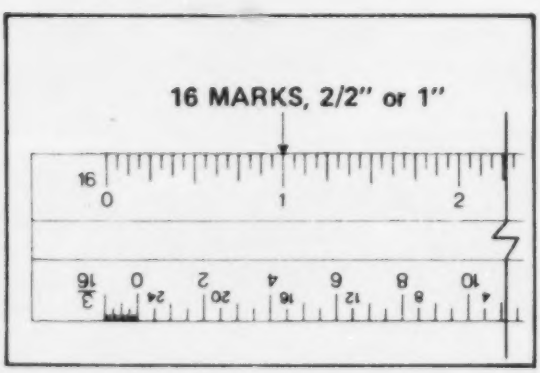
The student will measure in 1/2 inch intervals.



STEP 1 – Examine your scale again. This time count from zero eight marks over to the right.



STEP 2 – These eight marks equal one-half of an inch.



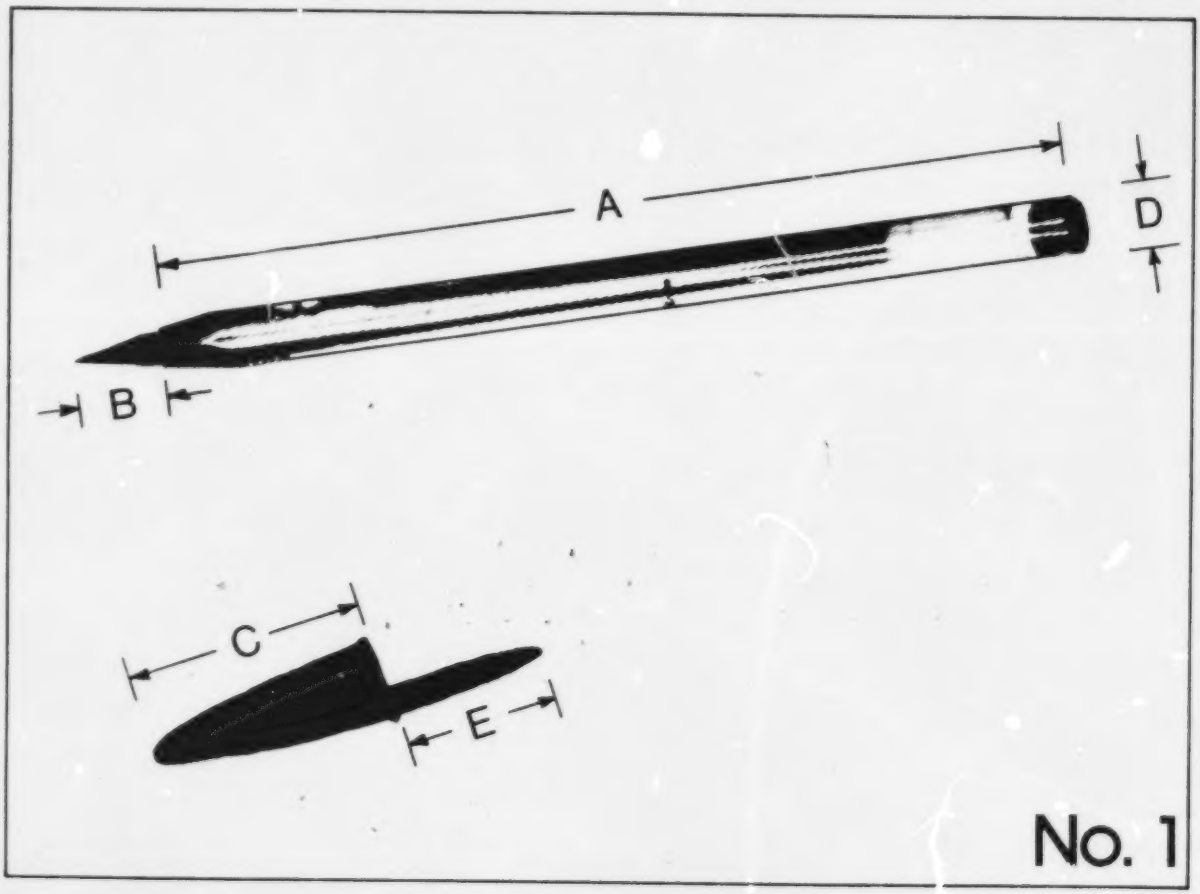
STEP 3 – Count sixteen marks over. This is two-halfs of an inch, or equal to one inch.

Check Point

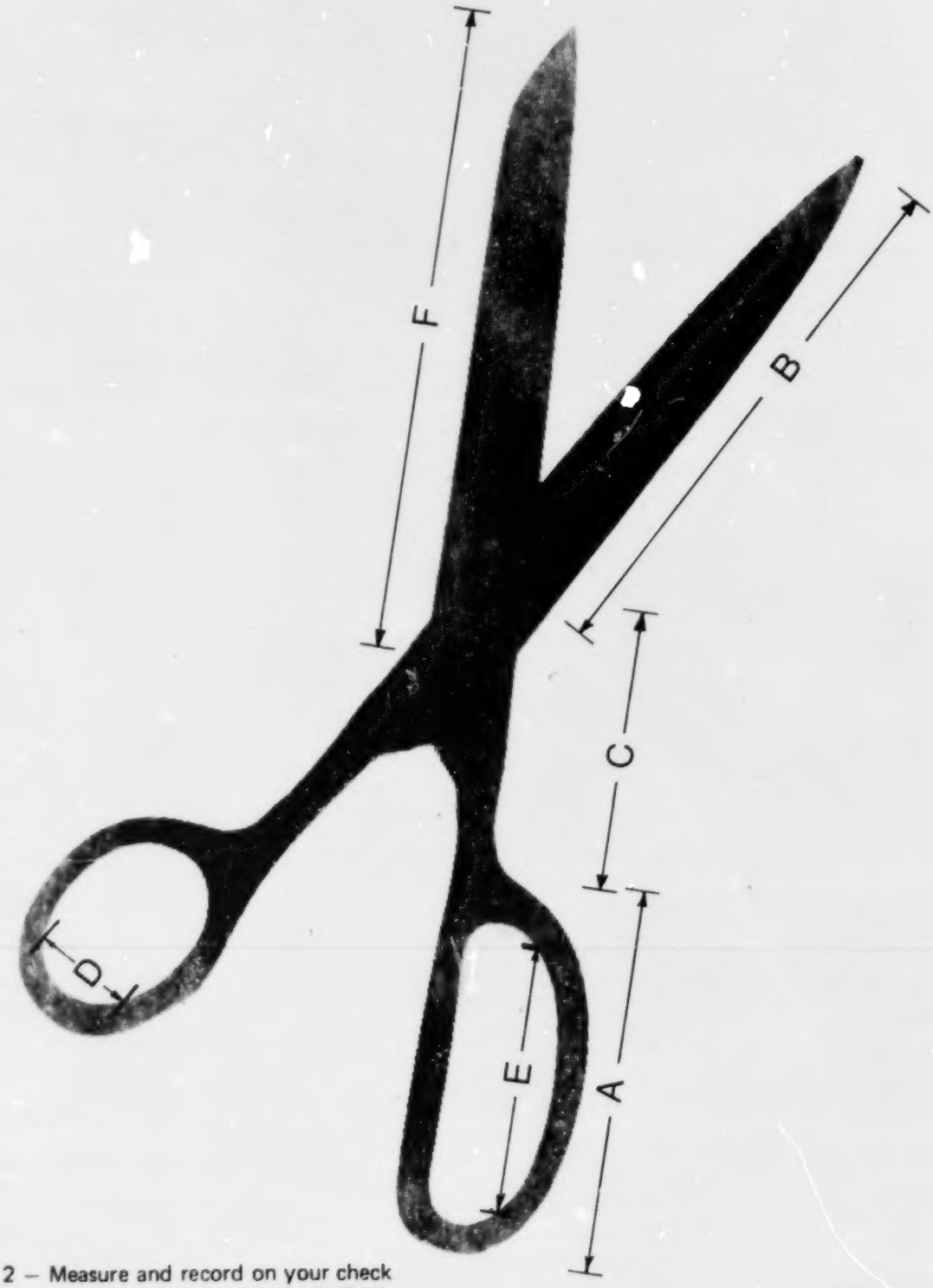
What is the number of halves from zero to one? If you counted two, proceed to the next step, if not, retrace steps 1 – 3.

Instructional Objective V

The student will correctly read and record the measurements of the given illustration.



STEP 1 – Measure and record on your check sheet the lengths of No. 1 – A, B, C, D,



STEP 2 – Measure and record on your check sheet the lengths of No. 2 – A, B, C, D, E, and F.

No. 2

Check Point

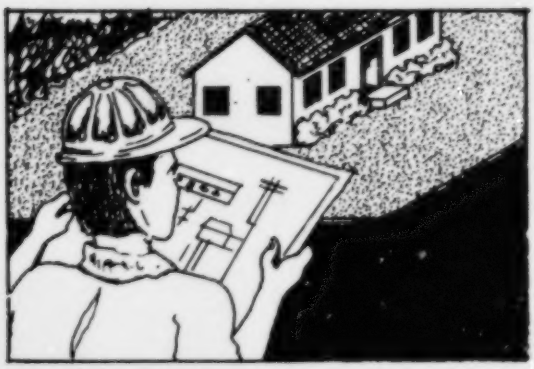
Your answers should be:

No. 1
A = 5 1/4 in.
B = 1/2 in.
C = 1-3/8 in.
D = 3/8 in.
E = 7/8 in.

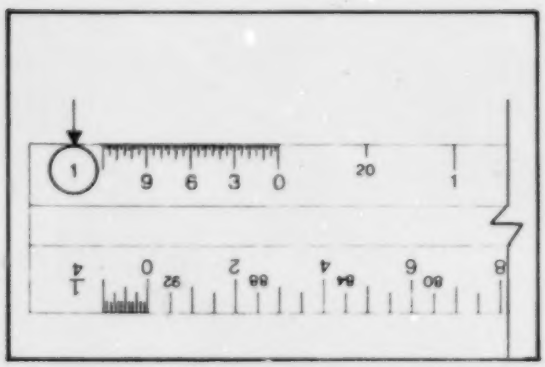
No. 2
A = 2-9/16 in.
B = 3-5/8 in.
C = 1-7/8 in.
D = 11/16 in.
E = 1-3/4 in.
F = 4-1/4 in.

Instructional Objective VI

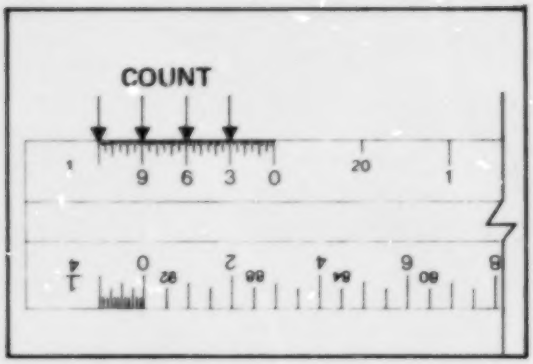
The student will read an architect's scale using the 1 scale.



STEP 1 – An architect's scale is used by drafters and architects in increasing or reducing the size of various objects. The various numbers on the sides of your scale relate to all of these ways to increase or reduce the size of an object.



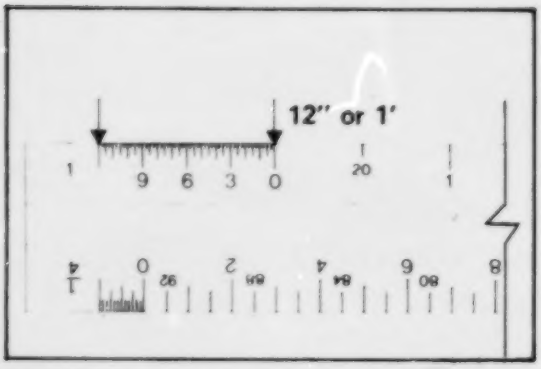
STEP 2 – Turn your scale so that the large number 1 is facing your left.



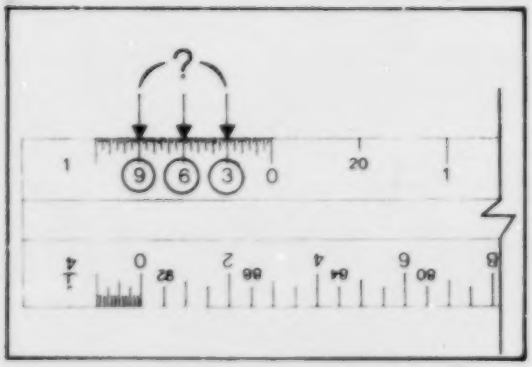
STEP 3 – Count the marks from zero to the left that have the same length as the zero mark.

Check Point

You should have counted four marks.



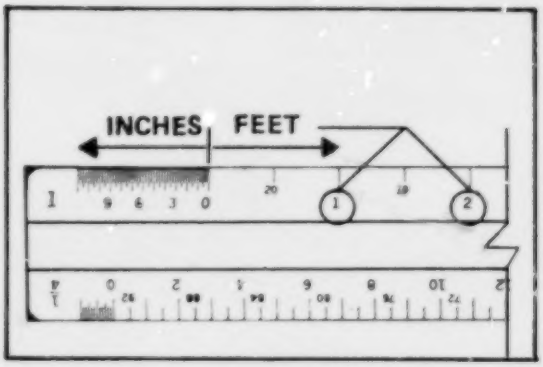
STEP 4 – If we are going to use this scale to reduce an object at a scale of 1" = 12" or 1'; zero to one would be equal to one foot, or 12 inches.



STEP 5 – If zero to one is a foot, then what does each number represent?

Check Point

Each number is equal to an interval of 3 inches.



STEP 6 – Now you can read this mini-scale just as you have read the 16 scale.

Check Point

Measure in feet and inches lines A, B, C. Record answer on Student Answer Sheet. Do not write in this booklet!

21

CHECKPOINT
1″ SCALE

A. _____

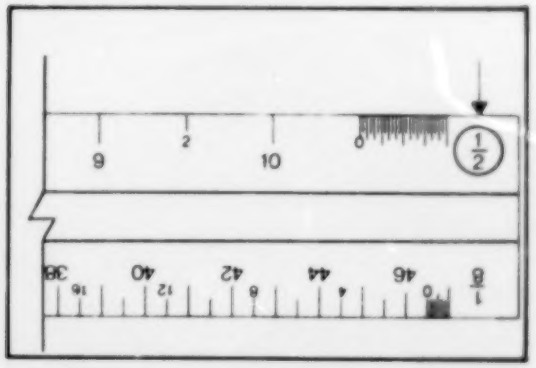
B. _____

C. _____

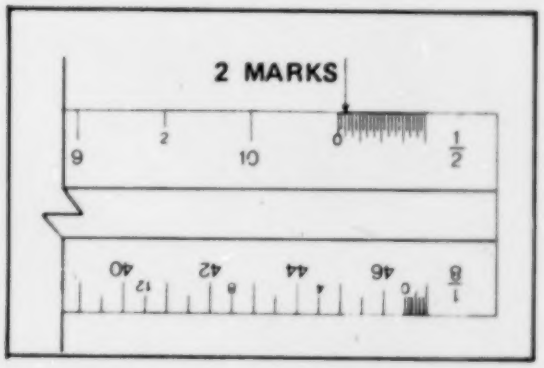
a – Check to see if you used scale 1.
b – Examine your work to see if you measured in feet and inches.
c – Answers to above checkpoint:
1 – Line A 1 foot, 6 inches
2 – Line B 4 feet, 9 inches
3 – Line C 6 feet, 4 inches
If correct go on, if not, go back and find your errors.

Instructional Objective VII

The student will read an architect's scale using the 1/2 scale.



STEP 1 – Turn your scale until the large 1/2 is on your right side.

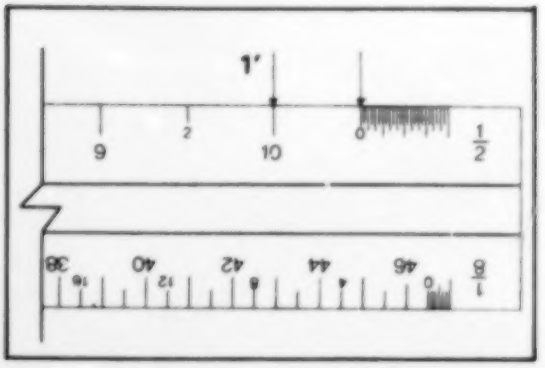


STEP 2 – Count every two marks from zero to the right.

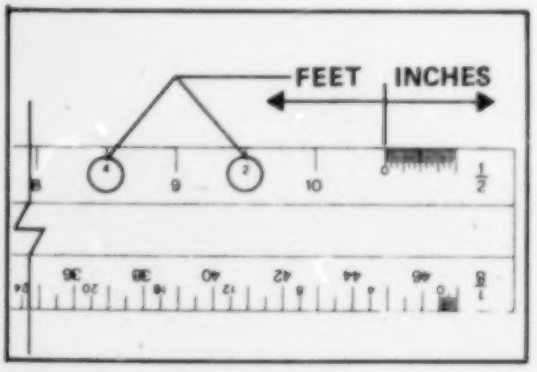
STEP 3 – How many marks did you count?

Check Point

You should have counted 12 marks. Therefore every two marks represent one inch, at a scale of ½" = 12" or 1'.



STEP 4 – Every mark from zero to the left equals 12 inches or 1 foot.



STEP 5 – Place scale onexample above, check your feet and inches.

Check Point

Measure in feet and inches lines A, B, C. Record answer on Student Answer Sheet.

23

CHECKPOINT
1/2" SCALE

A. _____

B. _____

C. _____

a – Examine to see if you are using scale 1/2 inch not scale 1.

b – Answers to above checkpoint:

1 – Line A 4 feet, 9 inches

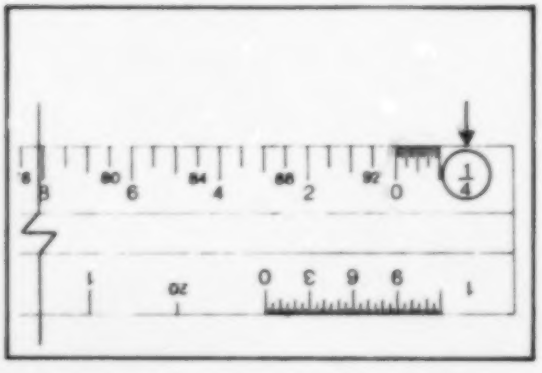
2 – Line B 7 feet, 6 inches

3 – Line C 8 feet, 8 inches

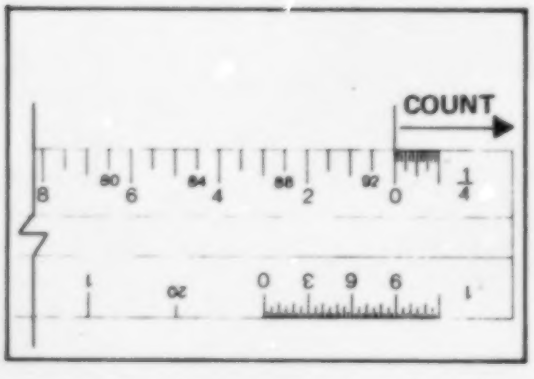
If correct go on, if not, go back and make corrections.

Instructional Objective VIII

The student will measure using the 1/4 in. scale.



STEP 1 – Turn your scale so that the 1/4 mark is on your right.

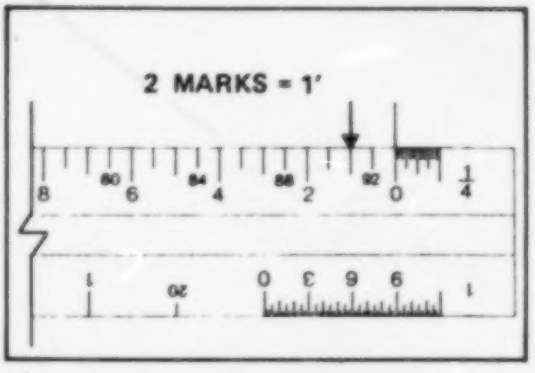


STEP 2 – Count the number of lines from zero to the right.

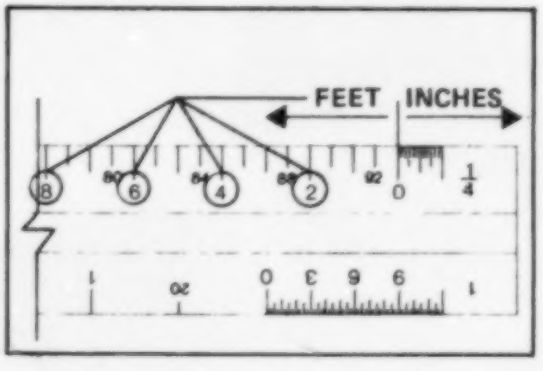
STEP 3 – How many lines did you count?

Check Point

You should have counted 12 lines. The distance between each line represents one inch, at a scale of ¼" = 12" or 1'.



STEP 4 – Every two marks from zero to the left equals 12 inches or 1 foot.



STEP 5 – Place your scale on the sample and check your understanding of feet and inches.

Check Point

Measure in feet and inches lines A, B, C and record on Student Check Sheet.

25

CHECKPOINT
1/4"SCALE

A. _____

B. _____

C. _____

a – Check to be sure you are using the right answer spaces.

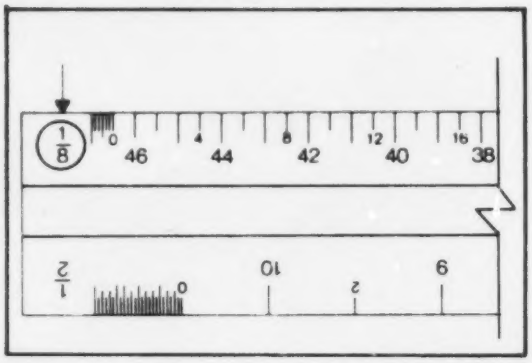
b – Answers to above checkpoint:

1 – Line A 7 feet, 3 inches
2 – Line B 3 feet, 9 inches
3 – Line C 9 feet, 4 inches

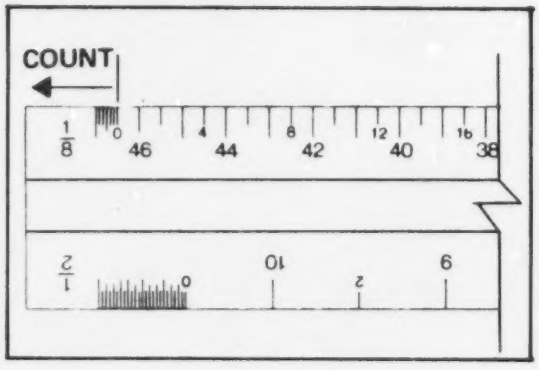
If correct, go on, if not, go back and make corrections.

Instructional Objective IX

The student will measure using the 1/8 inch scale.



STEP 1 – Turn your scale so the 1/8 mark is on your left.

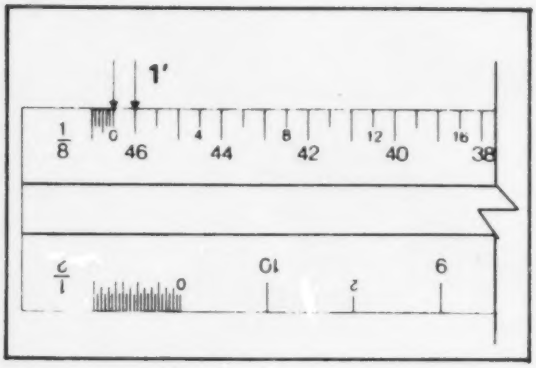


STEP 2 – Count the numbers from zero to the left.

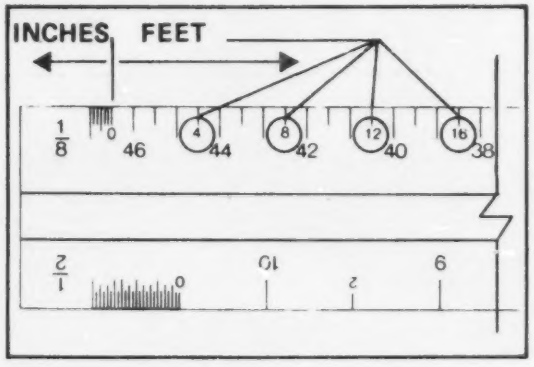
STEP 3 – How many lines did you count?

Check Point

You should have counted six lines. The distance between each line represents two inches, at a scale of 1/8" = 12" or 1'.



STEP 4 – Each mark from zero to the right equals one foot.



STEP 5 – Place your scale on the sample to check your understanding of feet and inches.

Check Point

Measure in feet and inches Lines A, B, C and record on Student Check Sheet.

CHECKPOINT
1/8" SCALE

A. ____

B. _____

C. _____

a – Examine scale while placing it on each step to see if it lines up.

b – Answers to above checkpoint:

1 – Line A 3 feet, 2 inches

2 – Line B 6 feet, 6 inches

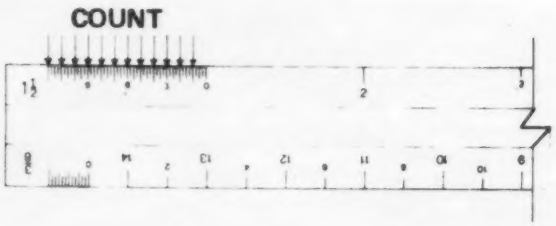
3 – Line C 9 feet, 8 inches

If correct go on, if not, go back and make corrections.

Instructional Objective X

The student will measure and record findings using the 1-1/2 scale.

STEP 1 – Turn your scale so the 1-1/2 mark is on your left.

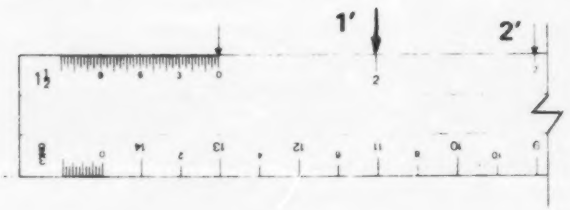


STEP 2 – Count every four lines from zero to the left.

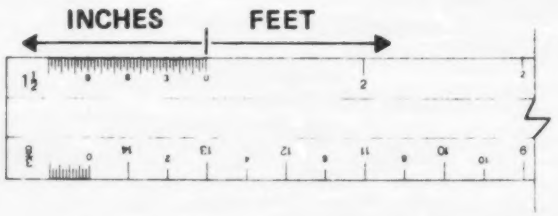
STEP 3 – How many marks did you count?

Check Point

You should have a total of 12. Therefore, every four marks equals one inch or every mark from zero to the left equals 1/4 inch, at a scale of 1½" = 12" or 1'.



STEP 4 – Every mark from zero to the right equals 12 inches or 1 foot.



STEP 5 – Place your scale on the example and see if you understand feet and inches.

Check Point

Measure in feet and inches Lines A, B, C and record on Student Check Sheet.

a – Check to be sure you are using scale 1-1/2 which will enlarge your drawing.

b – Examine your Answer Sheet to see if you are using the right blanks.

CHECKPOINT
1½"SCALE

A. _____

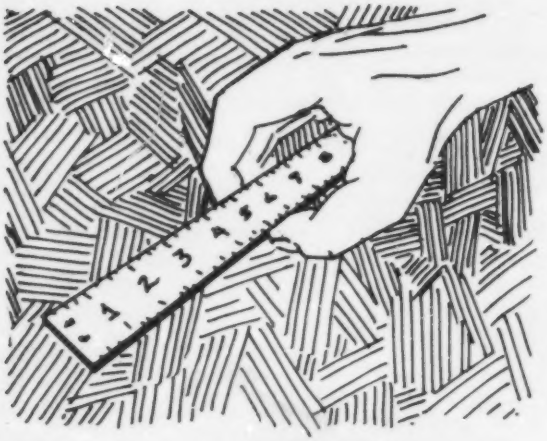
B. _____

C. _____

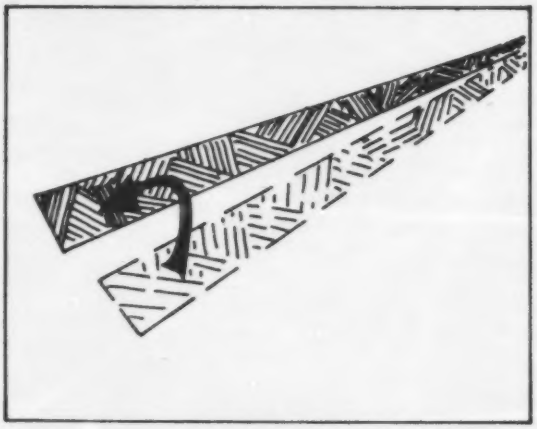
c – Answers to above checkpoint:
1 – Line A 1 foot, 9 inches
2 – Line B 2 feet, 6 inches
3 – Line C 3 feet, 8 inches
If correct go on, if not, go back and make corrections.

Instructional Objective XI

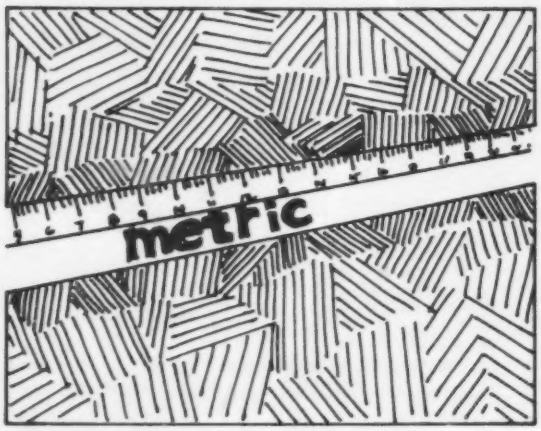
The student will identify the metric scale.



STEP 1 – Pick up the metric scale.



STEP 2 – Examine both sides of scale.



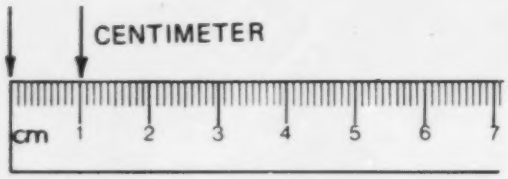
STEP 3 – Turn scale so you can read the word metric.

Check Point

Can you read the word metric?

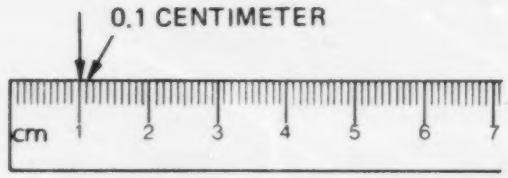
Instructional Objective XII

The student will read a metric scale in centimeters.

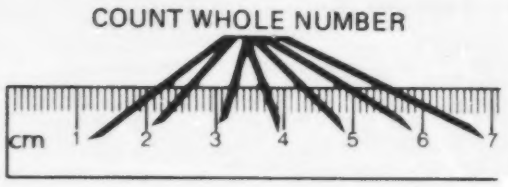


STEP 1 – Place scale on example above, notice the distance between the arrows.

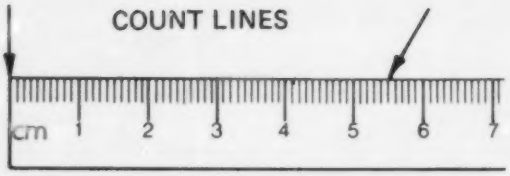
STEP 2 – The distance between the arrows equals one centimeter. Notice the number 1 on your scale.



STEP 3 – Any line beyond this point is one tenth of a centimeter or 0.1 cm.



STEP 4 – To measure in centimeters, count the whole numbers from zero on your scale.



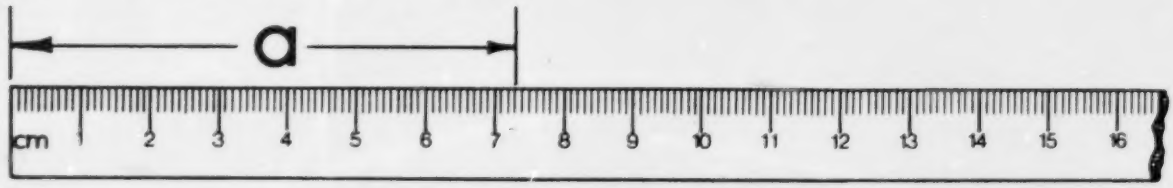
STEP 5 – Count the lines between whole numbers such as 0.1, 0.2, 0.3, until you reach the next whole number.

Check Point

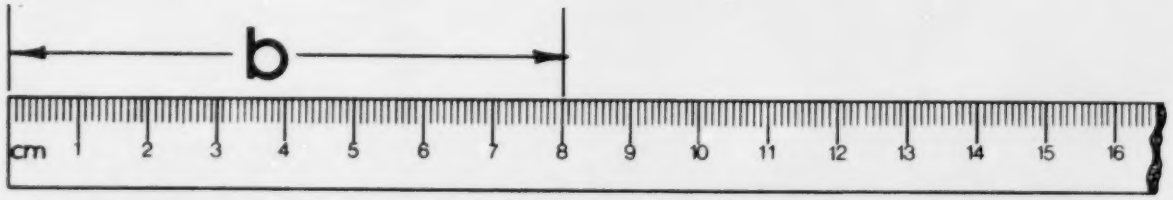
The illustration for Step 5 should be 5.5 centimeters.

Instructional Objective XIII

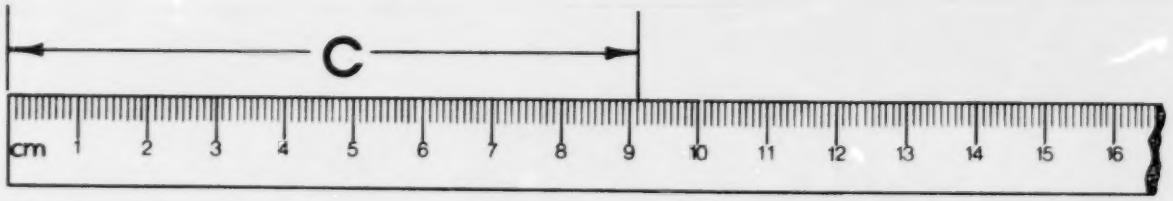
The student will record the following measurements on the Student Check Sheet.



STEP 1 –

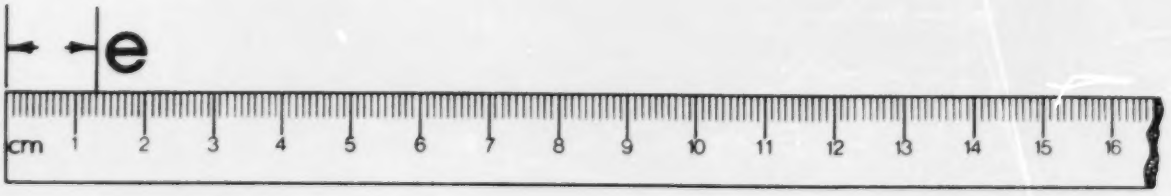


STEP 2 –

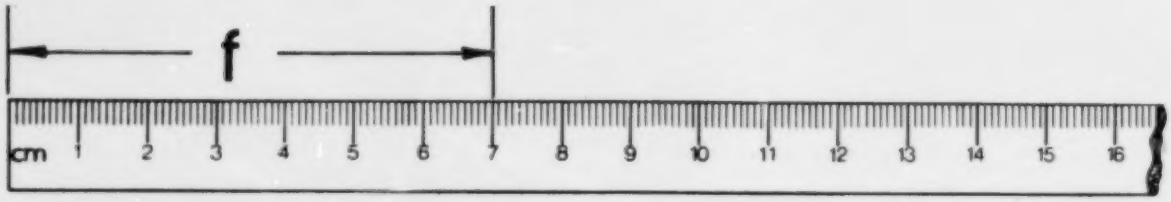


STEP 3 –

STEP 4 –



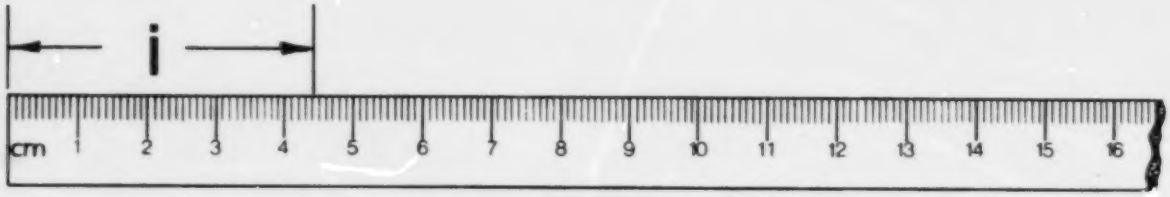
STEP 5 –



STEP 6 –

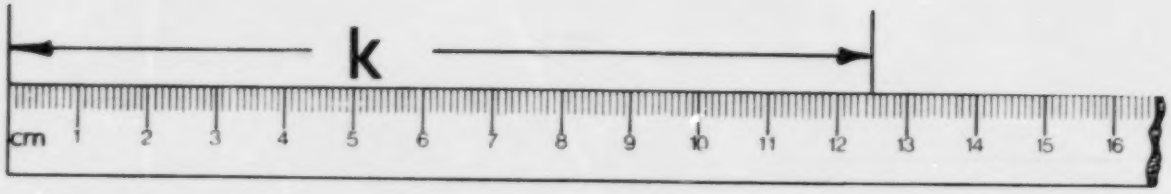
STEP 7 –

STEP 8 –

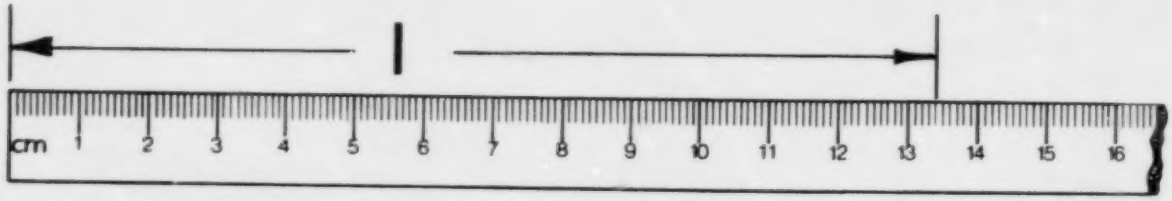


STEP 9 –

STEP 10 –



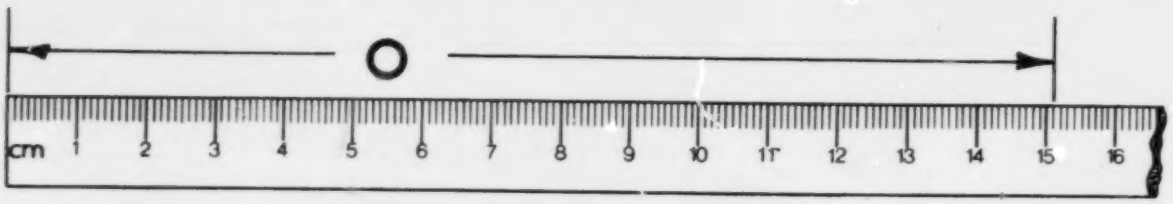
STEP 11 –



STEP 12 –

STEP 13 –

STEP 14 –



STEP 15 –

Check Point

Your answers should be:

A – 7.3 cm
B – 8 cm
C – 9.1 cm
D – 3.5 cm
E – 1.3 cm
F – 7 cm
G – 5.1 cm
H – 2.7 cm
I – 4.4 cm
J – 11.4 cm
K – 12.5 cm
L – 13.4 cm
M – 12.3 cm
N – 14.4 cm
O – 15.1 cm

OCCUPATIONAL DESCRIPTIONS

001.261-010 DRAFTER, ARCHITECTURAL (profess. & kin.)

Performs duties of DRAFTER (profess. & kin.) by drawing artistic architectural and structural features of any class of buildings and like structures: Delineates designs and details, using drawing instruments. Confirms compliance with building codes. May specialize in planning architectural details according to structural materials used as DRAFTER, TILE AND MARBLE (profess. & kin.).

007.161-018 ENGINEERING ASSISTANT, MECHANICAL EQUIPMENT (profess. & kin.) drafter; lay-out drafter; mechanical design technician.

Develops detailed design drawings and related specifications of mechanical equipment, according to engineering sketches and design proposal specifications: Analyzes engineering sketches, specifications, and related data and drawings to determine design factors, such as size, shape, and arrangement of parts. Sketches rough layout of machine and computes angles, weights, surface areas, dimensions, radii, clearances, tolerances, leverages, and location of holes. Computes magnitude, direction, and point of application of tension, compression, and bending forces and develops geometric shape of machine parts to accommodate operating loads. Drafts detailed multiview drawings of machine and subassemblies, including specifications concerning gear ratios, bearing loads, and direction of moving parts, using engineering data and standard references. Compiles and analyzes test data to determine effect of design on machine in relation to factors, such as temperature, pressures, speed, horsepower, and fuel consumption. Modifies machine design to correct operating deficiencies or to reduce production problems. May specialize in specific type of machine, such as air-cooled internal combustion engines, diesel engines, or machine tools.